

REMARKS

Claims 1-7, 9 and 14-25 are pending. The support in the published specification for the amendments to the claims is as follows: Claim 1: Claim 6 and [0077]; Claim 2: [0044] – [0051]; Claims 6, 18 and 19: deleting subject matter; and Claims 22-24: [0019]. No new matter is added.

Claim 3 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. (Office Action, page 3)

It appears that claim 3 may be misinterpreted, because claim 3 does not disclose a range within a range. Rather the three ranges at the end of claim 3 are for the (1) styrene-acrylic resin, the (2) pigment, and the (4) humectant, respectively, as recited. The ranges do not all relate to the humectant.

It is respectfully requested that the rejection be reconsidered and withdrawn.

Claims 1-5, 7 and 14-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Waki et al., U.S. Patent No. 7,008,994 (hereinafter "Waki") in view of Hendi et al., EP 0 790 281 B1 (hereinafter "Hendi"). Waki teaches an aqueous pigment dispersion, process for producing the same, and water-based ink. (Office Action, page 3)

Claim 1 has been further amended to recite that the (3) basic compound is an alkali metal hydroxide based on claim 6, therefore the claims are no longer anticipated. Thus, the anticipation rejection is overcome.

For several reasons, including the following, the claims are not obvious in light of the cited art as well. The process for producing an aqueous pigment dispersion for ink-jet recording of the claimed invention has the first step of producing a solid colored kneaded product and the second step of dispersing the solid colored kneaded product in an aqueous medium as recited in claim 1. Accordingly, it is possible to produce an aqueous pigment dispersion for ink-jet recording having an extremely high dispersing stability within a very short time, and thus the production efficiency is high (published specification [0015]-[0016]).

The reason such high production efficiency can be achieved is the kneading step (the first step) and as a result “the pigment particles which are ground finely by kneading are coated like a

capsule with the styrene-acrylic type resin, which acquires water dispersibility” ([0028]). It is also because the kneading step (the first step) proceeds with an extremely high efficiency.

Such effects arise from the combination use of the components in the kneading step of the claimed invention, i.e. (1) a styrene-acrylic resin with a styrene monomer unit of 50 to 90 mass %, and at least one unit selected from an acrylic monomer unit and a methacrylic monomer unit, having an acid value of 50 to 300 and a mass average molecular weight of 5,000 to 40,000, (2) a pigment, (3) a basic compound, and (4) a humectant. The applicant further limited the kneading step more detail so that the producing process exhibits such effects more reliably. That is, in the invention as recited in the amended claim 1, the (3) basic compound is an alkali metal hydroxide, and the solid content percentage of the colored kneaded product in the kneading step is from 50 to 80 mass%.

However,

the step of producing aqueous pigment dispersions using a sand mill is generally performed using a dispersed liquid of low viscosity having a small percentage of solid content such as a pigment, etc. Accordingly, a strong shearing force is hardly applied to pigments, thereby it takes a long time to crush large pigment particles. (published specification [0007]).

Otherwise, after kneading, “solid chips having a high solid content percentage are finally formed.” ([0012]). “Accordingly, this burdens the dispersing step (the second step) subsequent to the step of kneading with rolls, and as a result, there is possibility that dispersing time may be prolonged, or, even if dispersing is performed for a long time, large particles may remain.” ([0013]).

Comparing with the conventional process, since the solid content percentage of the colored kneaded product in the kneading step is from 50 to 80 mass% in the claimed invention, the effects are achieved more reliably as follows: “maintaining the viscosity of the colored kneaded product upon being kneaded to be suitably high, and increasing the shearing force applied to the colored kneaded product from a kneading apparatus during kneading, both crushing of the pigment in the colored kneaded product and coating of the pigment with the resin can be simultaneously achieved.” (published specification [0077]). “If the solid content percentage is less than 50 mass %, then the viscosity of the mixture decreases, kneading is likely to be insufficiently performed, and the pigment tends to be insufficiently crushed.” “However, if

the solid content percentage exceeds 80 mass %, then the kneading is likely to be difficult, even if it is heated to soften the resin sufficiently.” ([0077]).

In addition, in the claimed invention as recited in the amended claim 1, an alkali metal hydroxide is used as the (3) basic compound. In contrast, it is described in Waki that the thermoplastic resin is neutralized with an organic amine before predispersion in the first step (1) (col.5, lines 53-56). However, comparing with the claimed invention which is comprised simply of the kneading step (the first step) and the dispersing step (the second step) without an additional step such as a cross-linking step thereby producing an aqueous pigment dispersion, ***an additional step such as a cross-linking step (the third step) is necessary for the process of Waki in order to produce an aqueous pigment dispersion.*** That is, the kneading step (the first step) does not have such importance in Waki unlike the present invention, and Waki does not disclose or suggest the solid content percentage of the colored kneaded product in the first step.

Moreover, in Examples 1 and 2 of Waki in which an organic amine was not added in the kneading step, the solid content percentages are 95 mass% and 98 mass%, respectively. On the other hand, in Examples 3 and 4 of Waki in which an organic amine was added in the kneading step, the solid content percentages are 47 mass% and 43.5 mass%, respectively. As such, all of the solid content percentages in the Examples of Waki are out of range of claim 1 of the claimed invention, i.e. 50 to 80 mass%.

Since the kneaded product having an extremely high solid content percentage is produced in Examples 1 and 2 of Waki, it takes a long time to disperse in an aqueous medium and large pigment particles may remain as discussed above. On the other hand, the solid content percentages are small due to the large amount of water in Examples 3 and 4 of Waki, the resin adsorbed on the surface of the pigment may peel off or dissolve and as a result both sufficient crushing of the pigment in the kneaded product and coating of the pigment with the resin under a high shearing force cannot be achieved unlike the present invention. Although it is possible to make the resin which was neutralized and dissolved in a dispersing state again because Waki further has the cross-linking step (the third step), the production efficiency cannot reach that of the present invention.

As discussed above, Waki does not disclose or suggest the new limitation in the kneading step of the amended claim 1, and the ranges in the Examples of Waki are also out of the range of the claimed invention. Thus, it is apparent that the favorable coating of the pigment with the

resin as the claimed invention cannot be achieved by the producing process of Waki. It is not obvious for a person having ordinary skill in the art to employ such limitation of the present invention in the producing process of Waki.

In addition, as a basic compound which is used to neutralize the resin, ***an organic amine is used in Waki***. It is necessary in Waki to increase the dispersing ability by neutralizing the thermoplastic resin and to keep the pH to be 6.0 to 8.0 for the cross-linking reaction. When the organic amine is used, the pH can be easily controlled by removing the organic amine through an evaporator. It is also described in Waki that “moisture, solvents and organic amines scatter under the condition of heating, and functional groups start curing reaction at the same time; and a process in which moisture, solvents and organic amines scatter under the condition of heating, and polymerization curing occurs based on radical source such as organic amines at the same time.” (col. 8, lines 13-19). That is, in Waki, the organic amine is used for the cross-linking step. Thus, such reasons that the organic amine is used in Waki are not applicable to the present claims which do not recite a cross-linking step. Accordingly, ***although it may be possible to use the organic amine in order to neutralize the resin upon request in the subsequent cross-linking step if a person having ordinary skill in the art refers to Waki, it is not obvious to use an alkali metal hydroxide which does not have the cross-linking step***.

Moreover, ***the (1) styrene-acrylic resin of the claimed invention has a mass average molecular weight of 5,000 to 40,000***. It is because “if the weight average molecular weight is higher than 40,000, then the viscosity of the aqueous pigment dispersions tends to increase, and hence the jetting stability tends to deteriorate when it is used as a ink composition for ink-jet recording, in particular as a thermal jet type ink composition fluid for ink-jet recording.” (published specification [0039]). Although the rejection stated that Waki discloses the thermoplastic resin comprising a styrene-acrylic acid copolymer has Mn 2,000-20,000, the resin in the aqueous pigment dispersion of Waki is used with being cross-linked, it is apparent from the Examples and the Comparative Examples that the cross-linked resin has increased to ***500,000 to 800,000***. It is not possible to use the resin itself having such a large Mn increased after cross-linking as an ink for an ink-jet recording because the problems as mentioned above arise in connection with the ink jetting. Accordingly, it is not obvious for a person having ordinary skill

in the art to employ the resin of Waki as an ink. Actually, although Waki discloses an evaluation test of the produced ink as a writing ink or spin coater ink, Waki does not disclose any example or evaluation test as an ink-jet ink.

As such, the aqueous pigment dispersion according to the producing process of Waki does not satisfy the basic properties for the ink-jet recording ink. Accordingly, it is not obvious for a person having ordinary skill in the art to apply the process of Waki to the production of the ink-jet recording ink.

It is respectfully requested that the rejection be reconsidered and withdrawn.

Claims 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Waki et al., U.S. Patent No. 7,008,994 (hereinafter "Waki"). (Office Action, page 5)

Waki describes a cross-linked resin which has different properties than the ink as claimed as explained above. The amended claim 1 of the present invention is not obvious to a person having ordinary skill in the art over Waki, under 35 U.S.C. 103(a). Dependent claims 2-7, 9, 14-25 should be also allowed.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 04-1105.

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